AMENDED SPECIFICATION

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PATENT SPECIFICATION

887,172

DRAWINGS ATTACHED

887,172

Inventor: WILLIAM CHARLES CARLTON

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COMPLETE SPECIFICATION

Improvements in or relating to Shuttlecocks

We, CARLTON GENERAL DISTRIBUTORS (SHUTTLECOCKS) LIMITED, Parkstone Works, Wingletye Lane, Hornchurch, Essex, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to shuttlecocks. The shuttlecock which has been developed for serious play in the game of Badminton over many years, is a games missile having very distinctive flight characteristics and a regular conoidal shape.

It is convenient in this specification, to give certain definitions of some terms which will be used.

"Badminton Shuttlecock" will denote a shuttlecock which complies with the requirements as laid down in the Rules of Badminton, and also behaves in a manner to which the Badminton player has become accustomed.

"Shuttlecock" will mean a games missile having the flight characteristics and general profile of a shuttlecock, which is suitable for "knock about" play, but which does not necessarily conform with the rigid specification laid down for a Badminton shuttlecock.

Over many years shuttlecocks and in particular Badminton shuttlecocks developed into a conventional structure composed mainly of feathers set into a substantially hemispherical member of cork or similar material called the "Striking Cap." Such shuttlecocks herein called "Feather Shuttlecocks" are relatively fragile and expensive and efforts have been made for many years to utilise substitute materials in place of natural feathers.

In about 1950 moulded plastics shuttlecocks were developed successfully such for example as are described in British Patents 670,147 and 686,403.

Where in this specification it is required to draw distinction between a feather shuttlecock and one made of substitute material, the latter will either be referred to generically as a "Synthetic Shuttlecock" or referred to by reference to its method of manufacture, e.g. a "Moulded Shuttlecock," or by reference to the material of which it is principally composed e.g. a "Plastics Shuttlecock."

Some difficulty arises in attempting to describe shuttlecock structures because in the technical literature relating to them, notably Patent Specifications, there is a lack of consistent terminology. It is therefore convenient in this Specification to define the main structural characteristics both of a feather shuttlecock and a synthetic shuttlecock by reference to Figures 4 and 5 of the drawings accompanying the Complete Specification, in which:—

Fig. 4 is a perspective view of a conventional feather shuttlecock, and

Fig. 5 is an exploded perspective view of the components of one type of synthetic shuttlecock made in two pieces from moulded plastics material.

Referring to Fig. 4, the conventional feather shuttlecock comprises an assembly of suitably trimmed feathers as generally indicated by the bracket at 1. Usually from 12 to 16 feathers are used, arranged in the form of a flared cone, at the narrow end of which the quills 2 of the feathers are inset into a striking cap 3, which is substantially hemispherical and is made of cork or similar material such as sponge rubber. The striking cap, if of cork, is usually

covered by a layer of kid which provides a suitable surface to grip the racquet strings in play. The quills 2 of the feathers are shaven clean for some distance away from the striking cap 3, beyond which the flight portions 4 of the feathers are trimmed into a substantially oval shape, the feathers being mounted in overlapping relationship. The part of the feather shuttlecock at the wide end of the cone constituted by the overlapping flight portions of the feathers, and indicated generally by the bracket 5, is termed the "Vane Area." Usually a binding 6 is provided to assist in locating the quills 2.

Referring to Fig. 5, the synthetic shuttlecock illustrated is composed of a cone-shaped structure made of moulded plastics and indicated generally by the bracket 7, which is inset into a striking cap 8 which corresponds to the striking cap 3 of the feather shuttlecock. The moulded structure 7 is termed the "Skirt" and corresponds to the assembly of feathers in a feather shuttlecock.

To support and retain the shape of the skirt of a synthetic shuttlecock, it is desirable to provide stiffening members similar in function and general location to the quill portions of a feather shuttlecock. These members are herein called "Stems". In the case of a plastic skirt moulded in one piece the parts of these stems which converge at the narrow end of the cone, herein called the "Root Ends," finally merge together to form a continuous ring herein called the "End Ring". In some constructions a web extends diametrically across to close the end ring.

In the example shown, made by injection moulding, material enters the mould in the region of the injection pip 9 and fills the mould to form the end ring 10, whence it flows along suitably shaped and located apertures in the mould to form the stems 11, the circumferential bands 12 and the lattice-like structure 13 which constitutes a vane area equivalent to the vane area in the feather shuttlecock, and is composed of fine ribs extending from or between the stems. In some cases, part of the vane area may be constituted by a web-like foil structure between the ribs. The striking cap 8 is usually manufactured from cork or sponge rubber and arranged to slip over and be affixed to the end ring 10. In some less refined constructions the end ring is sometimes formed from a bowl shaped moulding, and also constitutes a striking cap.

The present specification is concerned with improvements in synthetic shuttlecocks and Badminton shuttlecocks of the type comprising a skirt, made from moulded plastics, affixed to a striking cap.

For convenience the term "Nose" will be used herein to denote the assembly consisting of the end ring and the striking cap with or without any covering which may be employed on the striking cap. The invention is specifically directed towards improvements in the nose of synthetic Badminton shuttlecocks.

Good quality feather shuttlecocks with cork striking caps give satisfactory performance, but their life is short; plastics skirted shuttlecocks with sponge rubber covering to plastics striking caps give a longer life and are acceptable to moderate players or those who do not habitually play with feather shuttlecocks, but are not necessarily acceptable to top class Badminton players because of the difficulty of changing readily from one type of shuttlecock to another.

The solid rubber type of striking cap is acceptable for outdoor play but is usually too heavy for indoor use.

The difficulty in interchanging feather and plastic skirted shuttlecocks is in some respects connected with 'feel' when the shuttlecock is struck by the racquet. The exact 'feel' is difficult to achieve because (a) there is no economic artificial material which possesses sufficient resilience and stiffness and yet is as light as a feather and, (b) because when cork is used in combination with a known type of plastics skirt, the result is too lively, or the cork breaks too readily.

When sponge rubber is used for the striking cap, if it is made light enough in density it has to be made so thick that the feel is too dead; if the sponge is made thinner the striking cap has to be made bigger in diameter and the strength for weight problem in the skirt becomes more difficult to solve.

First class Badminton players require a shuttlecock which has considerable stiffness in the skirt, since such stiffness aids resistance to deformation upon impact with the racquet and recovery of shape after deformation.

The object of the present invention is to provide a shuttlecock of the type in which the skirt is made of moulded plastics with a separate striking cap fixed thereto, and which will be acceptable to a large proportion of Badminton players.

According to the present invention there is provided a shuttlecock having a one piece moulded skirt structure, comprising an end ring having an outer diameter not less than $\frac{1}{2}$ inch, from which flared stems supporting the vane area extend outwardly, and a tubular stem extension collar, extending away from the end ring and the skirt, co-axially with the axis of the skirt; the collar having a diameter not greater than the smallest diameter of the skirt at the root end of the stems, and not less than 1/2 of the outer diameter of the end ring, and having a length which is not less than 3/4 the average outer diameter of the collar and a striking cap surrounding the stem extension collar and secured thereto and made of expanded polyvinyl chloride.

It is a feature of this invention that the striking cap is made of expanded plasticised polyvinyl chloride approximating in specific

gravity to that of cork, and is adapted to embrace and to be secured to the stem extension collar. In some cases the periphery of the striking cap will extend so as to embrace also the end ring and may even extend for a short distance around the root ends of the stems. Moreover, if the stem extension collar is open ended, the material of the striking cap may extend into the bore of the collar.

The nose resulting from the assembly above described imparts to the stems resistance to deformation by virtue of the relatively deep insertion of the stem extension collar into the striking cap, as compared, for example, with the comparatively shallow depth to which the end ring 10 is inserted in the striking cap 8 in a known type of plastics shuttlecock such as that illustrated in Fig. 5.

When a shuttlecock is struck on the nose by a racquet, it will in most cases commence to turn while still in contact with the strings and during the turn will lie sideways on the strings. At this instant the forces acting on the shuttlecock will tend to flatten the part of the skirt touching the strings so that its cross section assumes a substantially D-shape. If the stems and skirt structure are sufficiently stiff and resilient, the shuttlecock, as it leaves the racquet, will rapidly recover its true shape, and hence assume its correct attitude and trajectory.

The quicker the skirt recovers its true shape, the better will be the flight of the shuttlecock in play, assuming that it is otherwise properly balanced.

We have discovered that by providing an end ring and a stem extension collar of suitable dimensions we are able to provide a measure of compensatory action when the skirt is deformed in play since our structure is so arranged that upon lateral compression being applied across the diameter of the collar to deform its cross section towards an ellipse of which the short axis is parallel to the direction of the applied force, the skirt itself will tend to deform in cross section towards an ellipse of which the long axis is parallel to the direction of the applied force.

In the case of a shuttlecock having a skirt with a strong end ring and a stem extension collar embodied in a nose comprising a suitably resilient striking cap, the sideways pressure on the cap, which occurs during impact with the racquet, will tend to flatten the cap and collar but will also tend to deform the skirt in a direction to resist collapse against the racquet face, so that rapid recovery of shape is encouraged.

According to a further feature of this invention there is provided a Shuttlecock having one-piece moulded skirt structure comprising an end ring having an outer diameter not less than ½ inch, from which flared stems supporting the vane area extend outwardly, and a tubular stem extension collar extending away from the end-ring and the skirt co-axially with the axis of the skirt, the collar being of lesser diameter than the smallest diameter of the skirt, and being stepped radially inwardly from the root end of the stems by a flanged portion, the length of the collar being not less than 3/4 the average outer diameter of the collar, and at the end where it merges with the flanged portion, the outer diameter of the collar being not less than 1/2 the outer diameter of the end ring, and a striking cap surrounding the stem extension collar and secured thereto and made of expanded polyvinyl chloride. We have found that the construction of skirt having an inwardly stepped collar provides an increased compensatory action to resist deformating due to side pressure on the shuttlecocks in play.

Not only must every attempt be made to provide the lightest possible skirt consistent with adequate stiffness, but also no excess weight must be permitted in the striking cap since the majority of synthetic materials cannot be compared with cork for lightness and general feel. Cork is not altogether suitable as a material for attachment to a plastics shuttlecock skirt, particularly if it has to be hollowed out to take a stem extension ring.

We have found great advantages result from the use of expanded polyvinyl chloride, because by careful selection of an appropriate compound and by adjustment of the amount of plasticiser used, variations in the mass and resilience of the material can be made and additionally, this material can be given surface characteristics appropriate to a shuttlecock striking cap, and approximating to the kid covering on the striking cap of a feather shuttlecock.

The weight variations acceptable for any striking cap designed for use with a normal sized moulded skirt, are relatively small. Some variations in size are permissible, although the variations on outside diameter in Badminton shuttlecocks are usually very small, this measurement being in the order of 1 inch to 1 1/8 inches. Nevertheless, depending upon the balance which is intended to be imparted to the shuttlecock and the degree of reinforcement which it is desired to impart to the stems and nose assembly, there may be quite wide variations in the quantity of material used in a striking cap, and hence the ability to adjust the physical characteristics of expanded polyvinyl chloride, and in particular the size/weight ratio, render this material very suitable.

Various examples of the invention will now be described with reference to the drawings accompanying the Provisional Specification in which: —

Fig. 1 is a side elevation, on an enlarged scale, of a typical shuttlecock embodying the features of this invention.

Fig. 2 is a cross-sectional side elevation of the shuttlecock nose and part of the root end

of the stems of the shuttlecock illustrated in Fig. 1.

Fig. 3 is a view similar to Fig. 2 but showing an alternative structure where the stem extension collar is stepped inwardly from the end ring to provide compensatory stiffening in play.

Referring to Figs. 1 and 2 the skirt of the shuttlecock is a typical structure made from moulded plastics, for example by the method set forth in prior Specification 686,403. In this example the arrangement of holes employed is that disclosed in prior Specification 670,147. The skirt comprises a vane area A.1. of lattice formation supported by stems A.2 which converge at their root ends, A.3. The striking cap C is of conventional hemispherical form. As shown in Fig. 2, the root ends A3 of the stems merge at A.4. to form the end ring, which has substantial hoop length and from which the tubular extension collar B, extends in a direction away from the stems, being coaxial with the axis of the shuttlecock skirt.

The shuttlecock is a two-piece structure, the skirt being a one-piece moulding manufactured for example in nylon or polythene, and the striking cap being manufactured from expanded plasticised polyvinyl chloride.

It will be noted in Fig. 2 that the striking cap C embraces the stem extension collar B, and extends as far as the end ring A.4. In this example, the bore of the stem extension collar has been filled by the material of the striking cap, which has been allowed to extend up into the end ring at D, in order to lend support to the stems where their root ends begin to diverge from the end ring. In some cases it may be desirable to extend the material of the striking cap further along the root ends of the stems, either on the inside or outside or both. The degree to which this is done must be a matter of experiment since it will affect the amount of stiffness imparted to the skirt, and hence its resistance to deformation, as well as serving to protect the stems and end ring which are somewhat vulnerable, particularly if struck by the wood of the racquet.

The dimensions of this example are those appropriate to a Badminton shuttlecock, the maximum diameter of the skirt at the end of the vane area being between 2 1/2 inches and 2 5/8 inches in diameter. The axial length of the skirt is from 2 1/4 inches to 2 1/2 inches, measured from the point where the striking cap terminates, to the fringe of the skirt. The outer diameter of the stems at the point where they merge with the end ring is between 1/2 inch and 3/4 inch, and in this example the stem extension collar is the same diameter as the end ring, being a continuation thereof in the axial plane.

The finished striking cap is between 1 inch and 1 1/8 inches in diameter.

Referring now to Fig. 3 which shows only the root ends A3 of the stems and the nose of an alternative form of shuttlecock, the end ring A.4. which has substantial hoop strength, is connected to the stem extension collar B.1. by a stepped portion F which forms a flange. With a structure of this kind it may or may not be desirable to close the ends G1, G2 of the stem extension collar which, in the example is shown as being open ended.

In the present example the striking cap extends some distance up the outside of the root ends of the stems at E and, as in Fig. 2, extends inside the bore of the stem extension collar B.1. terminating level with the flange portion F.

A moulded shuttlecock skirt having the structural characteristics above described, and particularly the stepped arrangement of end ring and stem extension collar shown in Fig. 3, which has substantial hoop strength, and made for example from an appropriate material such as polythene or nylon, will be found to have a demonstrable compensatory action. If the stem extension collar B.1. is squeezed together between the fingers to deform the collar into an oval shape, there will be a pivotal action about the end ring which will tend to spread the stems so that the skirt tends to deform into an oval shape whose long axis is parallel with the direction of applied force on the collar. It is this effect which is achieved in play. When the resilient wall of the striking cap tends to deform under impact, it also deforms the stem extension collar but causes the stems in the region of the impact to tend to spread and to resist the deforming force of impact.

The compensatory effect above-described will not be obtained to such a degree if the end of the stem extension collar remote from the skirt is entirely closed.

The embodiment described with reference to Fig. 3 is particularly suitable for use as a Badminton shuttlecock. The dimensions are the same as those in the examples of Figs. 1 and 2, except for the outer diameter of the stems, at the point where they merge with the end ring, and the dimensions of the stem extension collar and those parts within the nose.

In this embodiment, the outer diameter of the end ring where the stems merge into it, is between 3/4 inch and 7/8 inch, while the outer diameter of the stem extension collar is considerably less, being in the order of 1/4 inch to 3/8 inch.

It will also be understood that for convenience of moulding, the tubular stem extension collar will normally be truly cylindrical with parallel walls.

The embodiments described are by way of example only and the dimensions herein given are by way of explanation, and are not intended as limitations save where specifically stated in the following claims.

WHAT WE CLAIM IS:—

1. A shuttlecock having a one-piece moulded skirt structure comprising an end ring having an outer diameter not less than ½ inch, from which flared stems supporting the vane area extend outwardly, and a tubular stem extension collar, extending away from the end ring and the skirt co-axially with the axis of the skirt; the collar having a diameter not greater than the smallest diameter of the skirt at the root end of the stems, and not less than 1/2 the outer diameter of the end ring, and having a length which is not less than 3/4 the average outer diameter of the collar and a striking cap surrounding the stem extension collar and secured thereto and made of expanded polyvinyl chloride.

2. A shuttlecock having a one-piece moulded skirt structure comprising an end ring having an out diameter not less than ½ inch, from which flared stems supporting the vane area extend outwardly, and a tubular stem extension collar, extending away from the end ring and the skirt co-axially with the axis of the skirt, the collar being of lesser diameter than the smallest diameter of the skirt, and being stepped radially inwardly from the root end of the stems by a flanged portion, the length of the collar being not less than 3/4 the average outer diameter of the collar, and at the end where it merges with the flanged portion, the outer diameter of the end ring, and a striking cap surrounding the stem extension collar and secured thereto and made of expanded polyvinyl chloride.

3. A shuttlecock as claimed in claim 1 or 2, in which the arrangement of the skirt structure is such that upon lateral compression being applied across the diameter of the collar to deform its cross section towards an ellipse of which the short axis is parallel to the direction of the applied force, the skirt itself will tend to deform in cross section towards an ellipse of which the long axis is parallel to the direction of the applied force.

4. A shuttlecock as claimed in claim 1, 2 or 3 wherein the tubular stem extension collar is closed at the end adjacent the skirt.

5. A shuttlecock as claimed in any of the preceding claims in which the stem extension collar is cylindrical in form.

6. A Badminton shuttlecock as claimed in any of the preceding claims in which the outer diameter of the stems, at the point where they merge with the end ring, is within the range 1/2 inch to 3/4 inch, the extreme outer diameter of the skirt at the outermost end of the vane area is within the range 2 1/2 inches to 2 5/8 inches, and the outer diameter of the stem extension collar where it merges with the end ring is within the range 3/8 inch to 7/8 inch.

7. A shuttlecock as claimed in any of the preceding claims, in which the end of the stem extension collar remote from the end ring is open, and in which the material of the striking cap extends into the bore of the stem extension collar.

8. A shuttlecock as claimed in any of the preceding claims, in which the striking cap surrounds both the stem extension collar and a portion of the root end of the stems.

9. A shuttlecock as claimed in any of the preceding claims, wherein the expanded polyvinyl chloride on the outer surface of the striking cap is provided with a texture approximating to that of kid.

10. A shuttlecock substantially as herein described with reference to Figures 1 to 3 of the drawings.

11. A Badminton shuttlecock substantially as herein described with reference to Figures 1 to 3 of the drawings.

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PROVISIONAL SPECIFICATION

Improvements in or relating to Shuttlecocks

We, CARLTON GENERAL DISTRIBUTORS (SHUTTLECOCKS) LIMITED of Parkstone Works, Wingletye Lane, Hornchurch, Essex, a British Company, do hereby declare this invention to be described in the following statement:

This specification relates to high quality shuttlecocks, and particularly to the noses of such shuttlecocks.

In this specification the skirt of the shuttlecock is that part of the shuttlecock which is made up of outwardly flared stems and vane area, and the nose of the shuttlecock is an assembly consisting of a nose body and the stem extension ring, and any nose covering which may be required.

It is known to include in the nose of a shuttlecock, a nose body made of cork, or sponge rubber or solid rubber and these are fixed to a skirt in the case of plastic shuttlecocks, or a plurality of feathers in the case of feather shuttlecocks.

Good quality cork and feather shuttlecocks give satisfactory performance, but their life is short; sponge rubber and plastic skirted shuttlecocks give a longer life and are acceptable to moderate players or those who do not habitually play with feather shuttlecocks, but are not necessarily acceptable to top class badminton players because of the difficulty of changing readily from one type of shuttlecock to another.

The solid rubber type is acceptable for out-

door play but is usually too heavy for indoor use.

The difficulty in interchanging feather and plastic skirted shuttlecocks is in some respects connected with 'feel' when the shuttlecock is struck by the racket. The exact 'feel 'is difficult to achieve because (a) there is no economic artificial material which possesses sufficient resilience and stiffness and yet is as light as a feather and, (b) because when cork is used in combination with a known plastic skirt, the result is too lively, or the cork breakes too readily.

When sponge rubber is used, if it is made light enough in density it has to be made so thick that the feel is too dead; if the sponge is made thinner the bowl (which in this type of shuttlecock corresponds to the stem extension ring) has to be made bigger in diameter and the strength for weight problem in the skirt becomes more difficult to solve. If solid rubber is used, the shuttlecock becomes too heavy.

The object of the present invention is to overcome these difficulties (which have been touched upon very lightly above).

The problem is to provide a nose of a shuttlecock which is big enough to comply with the laws of badminton (1"—1⅛" in dia) which when combined with a skirt of economic artificial plastic material of suitable design will provide a shuttlecock which will be acceptable to many first class badminton players.

First class badminton players require a stiff skirted shuttlecock and this can be obtained by reducing the diameter of the stem extension ring below ⅞" but when the known methods of making the nose are used the difficulties already mentioned become apparent.

This invention is that, in a shuttlecock consisting of at least a skirt, and a nose, and the nose incorporating at least a stem extension ring and a nose body, the shuttlecock is characterised in that the smallest diameter of the stem extension ring is less than ⅞" in diameter and this is combined with a nose body made of expanded plasticised polyvinyl chloride.

By using a small diameter stem extension ring a support for the stems may be made which combined stiffness and light weight, and by using expanded, plasticised, polyvinyl chloride for the nose body, a full diameter nose may be made which can be adjusted (by the amount of plasticiser) to give a satisfactory contact with the racket, and be made light enough (by expansion) to enable a full size nose (in its outside diameter) to be combined with an adequate contact area for fixing to the small diameter stem extension ring. The invention is developed so that the nose body will also support the stems.

There are a number of different applications of this invention, a representative selection, by way of indication and not limitation are given later.

A skirt is made of economic artificial plastic material and the stems of this skirt are extended to form a ring. This ring may be on substantially the same diameter as the stems where they are adjacent the nose or a step may be provided from the base of the stems so that the stem extension ring is of even smaller diameter.

The nose body is then made so that its outside shape corresponds with the known shape with the laws of badminton and is between 1" and 1⅛" in diameter. On its inside the nose body is formed so that it mates with the stem extension ring. If the stem extension ring is open ended the nose body may be made so that it also supports the inside of the ring and the inside of the stems themselves. It is not essential that the nose body should be in one piece.

In order that this invention should be clearly understood and readily carried into effect, examples will now be described with reference to the accompanying drawings in which:—

Fig. 1. is a side elevation of a typical shuttlecock embodying the invention.

Fig. 2. is a sectional side elevation showing one form of the invention.

Fig. 3. is a sectional side elevation showing a further form of the invention.

For and on behalf of
Carlton General Distributors (Shuttlecocks) Ltd.,
W. C. CARLTON
Director.

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887172 PROVISIONAL SPECIFICATION
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FIG. 1.

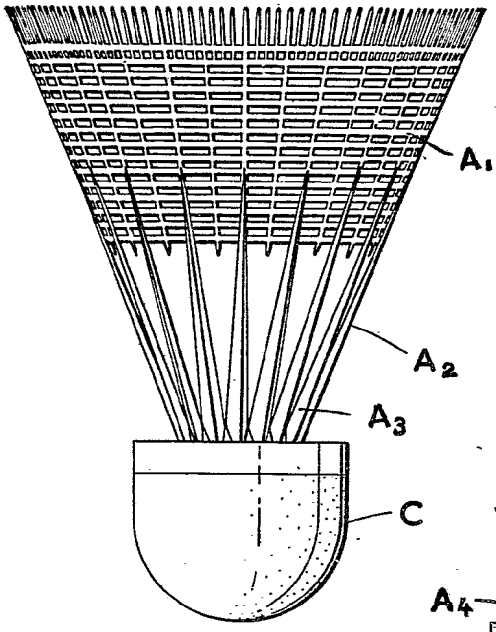


FIG. 2.

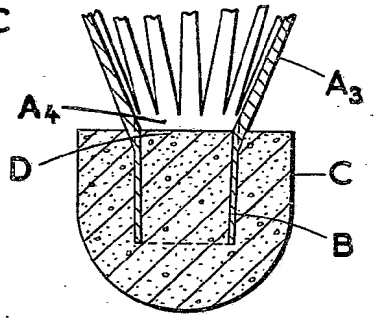
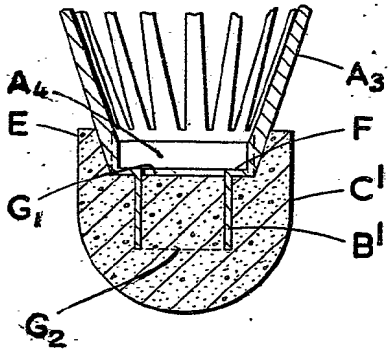


FIG. 3.



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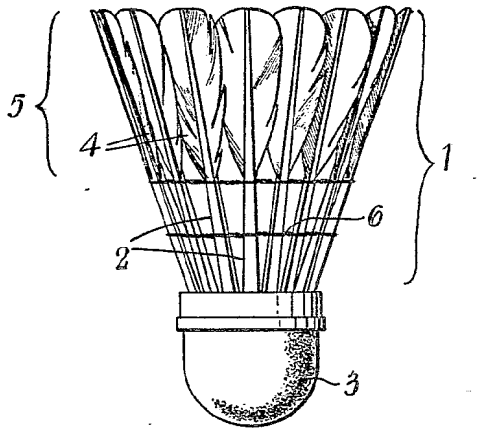

FIG.4

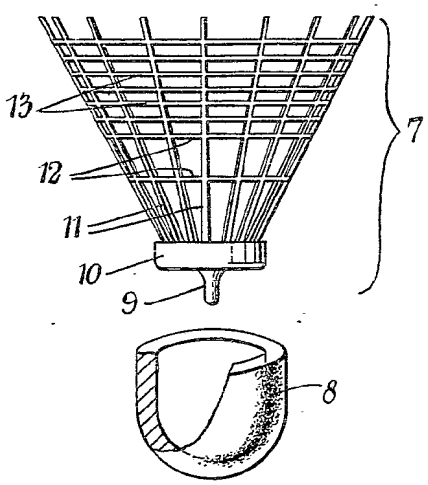

FIG.5